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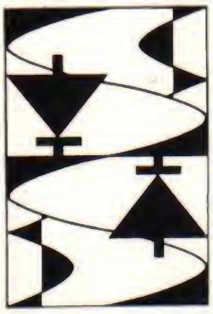

Regulated D.C. Power Supply

PE 1540/00

9416 015 40001

Operating manual

9499 160 08001

780725

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Operating manual
Bedienungsanleitung
Notice d'emploi

REGULATED D.C. POWER SUPPLY
STABILISIERTES SPEISEGERÄT
ALIMENTATION STABILISEE

PE 1540/00

9416 015 40001

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Contents

List of figures

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1. General

1.1. INTRODUCTION

The PE 1540 is a 120 W stabilized power supply designed for supplying and testing electrical and electronic circuits.

Regulation is achieved in two stages; a thyristor pre-regulator and a transistor series-regulator stage.
By means of thyristor pre-regulator optimum efficiency can be obtained and a favourable relation between dimensions and delivered power is obtained.
The transistor series-regulator gives continuously variable adjustment of the output voltage and current with good accuracy and stability with minimum ripple.
By means of coarse and fine controls, the output voltage can be continuously varied between 0 V and 40 V.
Similarly, coarse and fine controls provide continuously variable output current between 0 A and 3 A.
Front-panel LED indicators (green) show whether the instrument is functioning as a constant-voltage source or as a constant current source.
Two front-panel meters provide a visual indication of the stabilized output voltage and current.
The load must be connected to the front-panel terminals.

These terminals are floating with respect to earth, but either the + or – terminal can be linked to the adjacent earth.
If a larger continuously adjustable voltage or current source is required than is available from one instrument, then instruments can be connected in series or parallel to provide increased power.

By means of the terminal block at the rear of the instrument, the following possibilities are available:

- series and parallel connection of instruments in accordance with "Master-Slave" systems;
- remote sensing to stabilise the output directly at the load. Any excessive output due to disconnection of sensing conductors is also prevented;
- programming the value of the output voltage by means of an external resistance or an external voltage;
- programming the value of the output current by means of an external resistance or an external voltage;
- a combination of the above possibilities.

NOTE: The design of this instrument is subject to continuous development and improvement. Consequently, this instrument may incorporate minor changes in detail from the information contained in this manual.

1.2. CHARACTERISTICS

This instrument has been designed and tested in accordance with IEC Publication 348 for Class I instruments andhas been supplied in a safe condition. The present Instruction Manual contains information and warnings which shall be followed by the purchaser to ensure safe operation and to retain the instrument in a safe condition.

1.2.1. Technical data

1.2.1.1. General

Safety	In accordance with IEC 348, Safety Class I.
D.C. test voltage	2100 V between primary and chassis 4200 V between primary and secondary 2100 V between secondary and chassis
Output terminals	Floating with respect to earth. The maximum permissible d.c. voltage between any one of the output terminals and chassis is 250 V. The "+" or "–" terminal may be connected to the chassis, if desired.
Radio interference	According to VDE 0875 below the K curve.

1.2.1.2. Input

A.C. voltage	110-127-220-240 V (+ or – 10 %)
Frequency	50 to 60 Hz
Consumption	Max. 320 VA
Protection	With fuses F1 and F2, 2 A slow-blow

1.2.1.3. Output

a. As voltage stabiliser

Range	0 ... 40 V continuously adjustable by means of R1 (coarse) and R2 (fine). The range of R2 is approx. 1 V.
Output effects (stability related to static operation)	
1. Line regulation	For mains voltage variation of + or – 10 % Source effect (including settling) ⩽ 0,01 % or 2 mV, whichever is greater.
2. Load regulation	For load variations from no-load to full-load and vice versa. Load effect (including settling) ⩽ 18 mV.
3. Temperature coefficient	⩽ 0,01 % per K from the adjusted output voltage or 1 mV per K, whichever is greater.
4. Periodic and random deviation (PARD)	R.M.S. value ⩽ 1 mV (+ or – output terminal earthed). High frequency spikes peak to peak amplitude 40 mV. Bandwidth 50 MHz.
Dynamic operation	
1. Transient recovery time	⩽ 50 μs for a current change from 80 % to 100 % and vice versa, and a $\frac{di}{dt} \geqslant 1$ A/μs (see Fig. 7.).
2. Dynamic internal impedance	For sinusoidal load variations from 80 % of full-load to full-load and a frequency of: 1 kHz ⩽ 0,02 Ω 10 kHz ⩽ 0,06 Ω 100 kHz ⩽ 0,12 Ω 250 kHz ⩽ 0,20 Ω
Protection	– Reverse voltage protection – Constant current stabiliser – Disconnecting sense wires

b. As current stabiliser

Range	0 ... 3 A, continuously adjustable by means of R3 (coarse) and R4 (fine) The range of R4 is 75 mA.
Output effects (stability related to static operation)	
1. Line regulation	For mains voltage variation of + or – 10 % Source effect (including settling) ⩽ 0,05 % or 0,5 mA whichever is greater.
2. Load regulation	For load variations from point D to E and vice versa (see Fig. 6.). Load effect (including settling) 4 mA.
3. Temperature coefficient	⩽ 0.3 per K
4. Ripple current	R.M.S. value ⩽ 1 mA.
Cross-over point	See point B-C-D in Fig. 6. This value applies for any set output voltage between 0 and 40 V and output current between 0 and 3 A.

c. Series connection	Instruments may be series connected until the maximum permissible d.c. voltage of 250 V between an output terminal and chassis is reached.
d. Parallel connection	An arbitrary number of instruments may be connected in parallel for greater current outputs.

1.2.2. Environmental data

The environmental data are valid only if the instrument is checked in accordance with the official checking procedures. Details on these procedures and failure criteria are supplied on request by the PHILIPS Organization in your country, or by N.V. PHILIPS' GLOEILAMPEN FABRIEKEN, TEST AND MEASURING DEPT., EINDHOVEN, HOLLAND.

Ambient temperature:	
– specified operating temperature	0 to +40 °C
– rated range of operation	–10 °C to +40 °C
– storage and transit	–40 °C to +70 °C
Cooling	Convection cooled. The air convection may not be impeded.
Damp heat, cyclic tests (12 + 12 hour cycle)	21 days ambient temperature 25 °C to 40 °C at a humidity of 93 %.
Bump tests	1000 bumps at an acceleration of 100 m/s^2, ½ sine for 6 ms duration in each of three directions.
Vibration tests	30 min. in each of three directions 10 Hz to 150 Hz, peak to peak amplitude 0,7 mm and 50 m/s^2 acceleration.

1.2.3. Mechanical data

Dimensions	Height 153 mm Width 210 mm Depth 271 mm
Mass	8 kg net 8,4 kg with packaging

1.3. ACCESSORIES

Operating manual.

2. Directions for use

2.1. INSTALLATION

Before connecting the instrument to the mains, visually check the cabinet , controls and connectors etc., to ascertain whether any damage has occured in transit. If any defects are apparent, do not connect the power supply to the mains.

Warning: This instrument generates high voltages and should not be operated with the cabinet plates removed.
The mains plug must be removed before attempting any maintenance work.

2.1.1. Dismantling

The opening of covers or removal of parts, except those to which access can be gained by hand, is likely to expose live parts and also accessible terminals may be live.
The instrument shall be disconnected from all voltage sources before any adjustment, replacement or maintenance and repair during which the instrument will be opened.
If afterwards, any adjustment, maintenance or repair of the opened instrument under voltage is inevitable, it shall be carried out only by a skilled person who is aware of the danger involved.
The replacement of parts in the primary circuit of the instrument are at the user's own risk.
After replacement of such parts (the fuse excepted) a high-voltage test in accordance with IEC Publication 348 is strongly recommended.
Bear in mind that capacitors inside the instrument may still be charged, even if the instrument has been disconnected from all voltage sources.
To remove the top and bottom plate use a screwdriver to lift carefully the ornamental frame over the edge of the front plate (see Fig. 5a.).
The top- or bottom plate can be removed now in the direction of the arrow (see Fig. 5b.).
After remounting the top- or bottom plate, the ornamental frame can be pressed back to its original position by hand.

2.1.2. Earthing

The instrument is earthed via the three-core mains cable. The mains plug shall only be inserted into a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension cord without protective conductor.

The circuit to be supplied may be earthed via the earthing terminal X3 on the front panel.

Warning: Any interruption of the protective conductor inside or outside the power supply, or disconnection of the protective earth terminal, is likely to make the power supply dangerous. Intentional interruption is prohibited.

When an instrument is brought from a cold into a warm environment, condensation may cause a hazardous condition. Therefore, make sure that the earthing requirements are strictly adhered to.

2.1.3. Cooling

Make sure that the natural air-circulation via the air vents in the cabinet is not blocked.

2.1.4. Remote sensing

Remote sensing enables the output voltage to be stabilised directly at the load. The variation in voltage drop in the connecting wires due to varying loads can thus be compensated for. In this way, the voltage can be maintained constant at the load.
For remote sensing, the connections on terminal block X4, and between X4 and the load, must be wired as given in Fig. 8c.
The current-carrying wires to the load must be of sufficient cross-section so that the voltage loss in each of these wires is less than 0,5 V.
Screened and/or twisted wires must be used for the sense wires, to minimise interference voltages.
Depending on the application, it may be useful to connect a 330 μF ± 50 % - 63 V capacitor directly across the load for better dynamic response when applying remote sensing.

NOTE: The instrument voltmeter P1 indicates the voltage on the output terminals, which is not necessarily that on the load.

2.1.5. Programming the output voltage

The output voltage can be programmed as follows:

a. By connecting a resistor of 1 kΩ per volt output voltage as shown in Fig. 8d. The internal coarse and fine voltage controls R1 and R2 must be turned completely to the right. During operation no connections may be interrupted.

b. By connecting an adjustable voltage source of 1 V per volt output voltage as shown in Fig. 8e. The voltage source must be able to consume 1 mA.

To prevent additional ripple voltage at the output terminals, the wires should be twisted and/or screened as shown in Figures 8d. and 8e.

2.1.6. Programming the output current

Remote programming of the output current is possible as follows:

a. By connecting a resistor of approx. 160 Ω per ampere output current as shown in Fig. 8f. The internal coarse and fine current controls R3 and R4 must be turned completely to the right.
During operation no connection may be interrupted.

b. By connecting an adjustable voltage source of approx. 160 mV per ampere output current as shown in Fig. 8g. The voltage source must be able to consume 1 mA.

To eliminate extra ripple to the load, the wires should be twisted and/or screened as shown in Figures 8f. and 8g.

2.1.7. Series connection

Instruments may be series connected until the maximum permissible d.c. voltage of 250 V between any output terminal and earth is reached.

Warning: When one of the output terminals "+" or "–" is connected to earth terminal X3 (⏚), the adjusted output voltage is present between the unearthed output terminal and instrument chassis.

Instruments may be connected in series in two ways:

a. By connecting the "+" output X2 of the first instrument with the "–" output X1 of the second instrument and so on. The voltage on the load is then the sum of the individually adjusted output voltage.
The current of each instrument must be adjusted higher than the required load current, but lower than the value that could damage to the load.

b. By connecting in accordance with the Master-Slave system (see Fig. 8h.).
The output voltage of every instrument is adjusted by means of R1 and R2 of the "master" instrument.
The controls R1 and R2 of the "slave" instruments must be turned completely to the left.
When R3 and R4 of the slave instruments are set at maximum output current, it is possible to adjust for maximum load current with R3 and R4 of the master instrument.
For series connection in accordance with this system, a 40,5 kΩ, 1 %, 0,1 W resistor must be added and terminal block X4 must be wired, as shown in Fig. 8h.

2.1.8. Parallel connection

Parallel connection of instruments is unlimited, and can be achieved in two ways as follows:

a. By connecting the "+" outputs X2 together, and the "–" outputs X1 together.
The maximum output voltage is then equal to the instrument having the highest adjusted output voltage.
The maximum current through the load is the sum of the individually adjusted current values.
The maximum current must be adjusted higher than the desired current value through the load, but lower than the current that could damage the load.

It is recommended that the power delivered by each instrument is approximately the same; i.e. the maximum output voltages and currents are set approximately equal for each instrument.

b. By connecting in accordance with the Master and Slave system (see Fig. 8i.)
The maximum output current for all instruments in this system is adjusted with R3 and R4 from the master instrument.R3 and R4 of the slave instruments are inoperative.
The output current of the slave instruments is equal to the output current set on the master instrument.
The output voltage of the slave instruments must be adjusted higher (2 % approx.) than the output voltage of the master instrument.

2.1.9. Load

The load must be connected on the front panel. Connection is made by means of the "+" and "–" output screw-terminal connections X2 and X1 (see Fig. 1.). The load can be earthed via screw terminal X3.

2.1.10. Mains connection

Before inserting the mains plug into the mains socket, make sure that the instrument is set to the local mains voltage.
On delivery, the power supply is set to 220 V. If the power supply is to be used with 110, 127 or 240 V mains supply, the connections on the mains transformer must be changed in accordance with Fig. 4. The transformer is accessible after removing the top plate of the cabinet. To this end see chapter 2.1.1. dismantling.
If the stabiliser is set to a different mains voltage, replace the sticker at the rear of the cabinet by an indication which corresponds to the mains voltage set.
If fuses of a different rating are required, the indication on the fuse holders must also be replaced by the corresponding current value.

Warning: The instrument shall be set to the local mains voltage only by a skilled person who is aware of the hazard involved. The power supply shall be disconnected from all voltage sources when it is to be adapted to a different mains voltage.

Check before connecting the instrument to the mains that the correct fuses F1 and F2 are fitted.

2 A slow-blow for 220 - 240 V
4 A slow-blow for 110 - 127 V

The fuse holders of F1 and F2 are located at the rear of the instrument.

Fuse replacement.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of mended fuses and short-circuiting of the fuse holders shall be avoided. The instrument shall be disconnected from all voltage sources when a fuse is to be replaced.

In order to meet the safety requirements, the wires must be fixed to the solder tags of the transformer in such a way that, when the tin melts, they do not become detached.

2.1.11. Controls, indicators and terminals

Front panel (see Fig. 1.).

R1	Coarse adjustment of the output voltage.
R2	Fine adjustment (range 1 V) of the output voltage adjusted with R1.
V1	LED indicates green when the instrument is working as constant voltage source.
R3	Coarse adjustment of the output current.
R4	Fine adjustment (range 75 mA) of the output current adjusted with R3.
V2	LED indicates green when the instrument is working as constant current source.
X1, X2	"–" respectively "+" output terminal.
X3	" ⏚ " Earth terminal for earthing the positive or negative output terminal, or for earthing the load.
S1	Power on. Control for switching the instrument ON and OFF.
P1	Voltmeter for indicating the output voltage.
P2	Ampere meter, for indicating the output current
X4	Terminal block; possibility for connection of the different facilities given in section 2.1.4. to section 2.1.8. (see Fig. 2.).
F1, F2	Fuses 2 A slow-blow for 220 V and 240 V mains voltage. 4 A slow-blow for 110 V and 127 V mains voltage (see Fig. 2.).

2.2. OPERATION

2.2.1. Mains

After mains connection (see section 2.1.10.) the instrument can be switched on by means of S1.

2.2.2. Output voltage

The stabilised output voltage is adjustable from 0 V to a value higher than 40 V by means of the coarse and fine controls. The adjustable value of R1 can be varied by 1 V with fine control R2.

2.2.3. Output current

The stabilised output current is adjustable from 0 A to a value higher than 3 A with coarse and fine adjustments R3 and R4. The adjustable value of R3 can be varied by 75 mA with fine control R4. For the adjustment of the constant output current it is possible to short circuit the output terminals. It is recommended that this is done at a low adjusted value of output voltage.

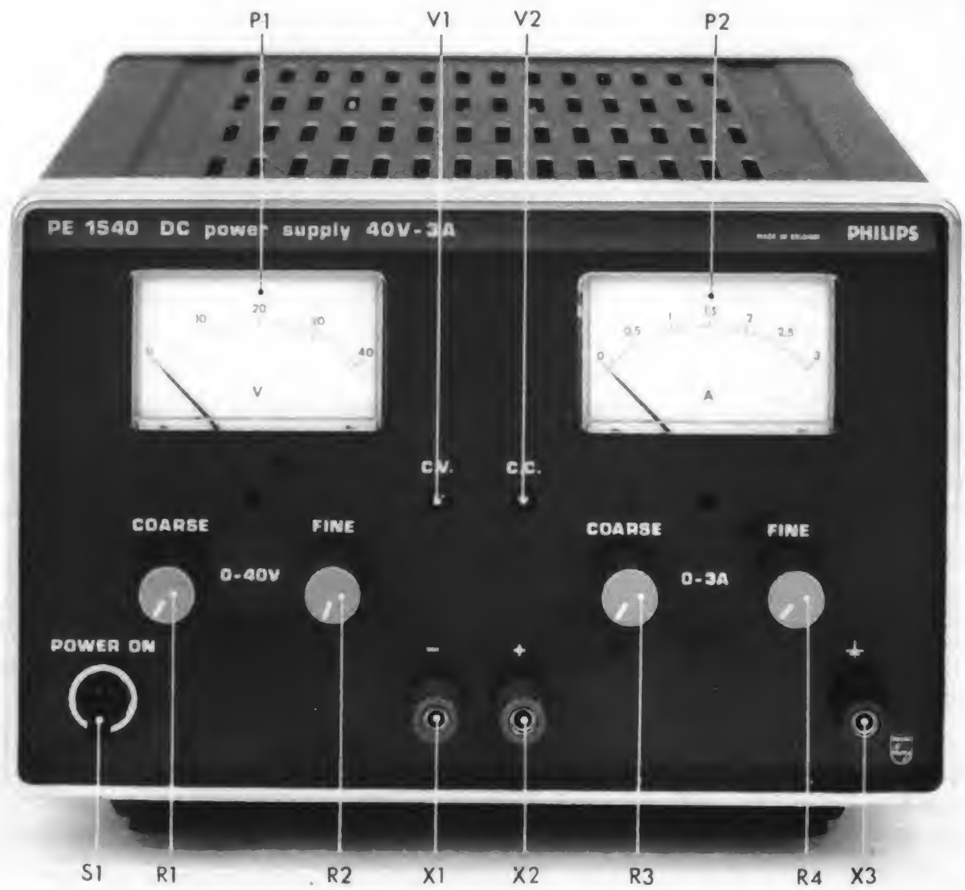

Fig./Abb. 1.

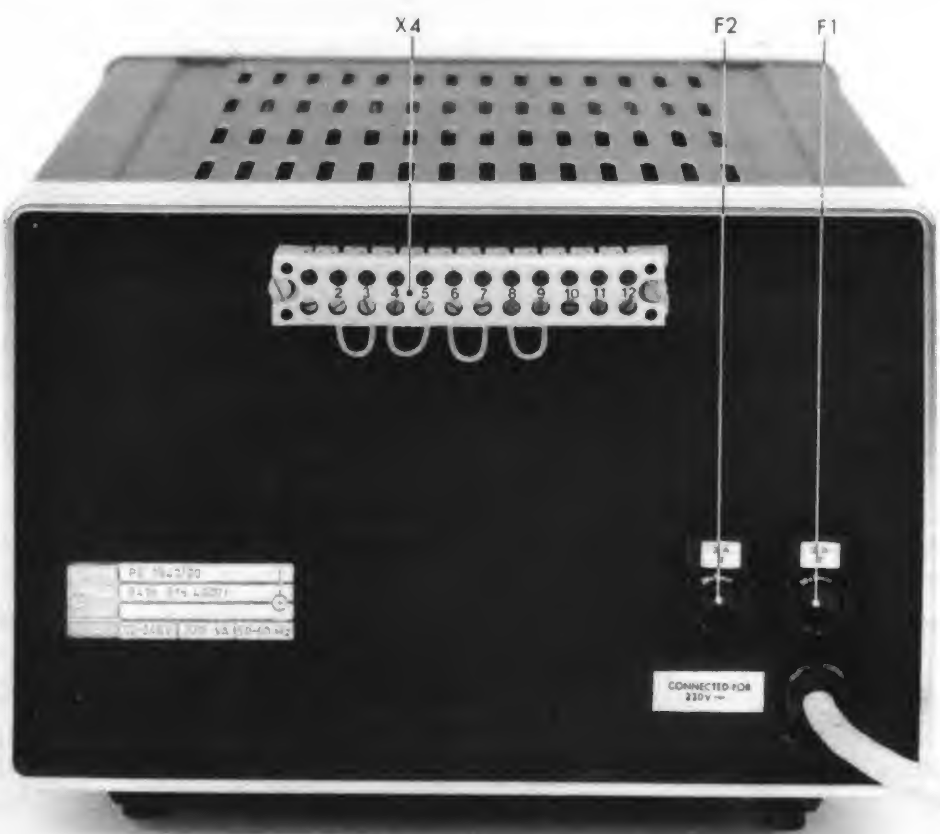

Fig./Abb. 2.

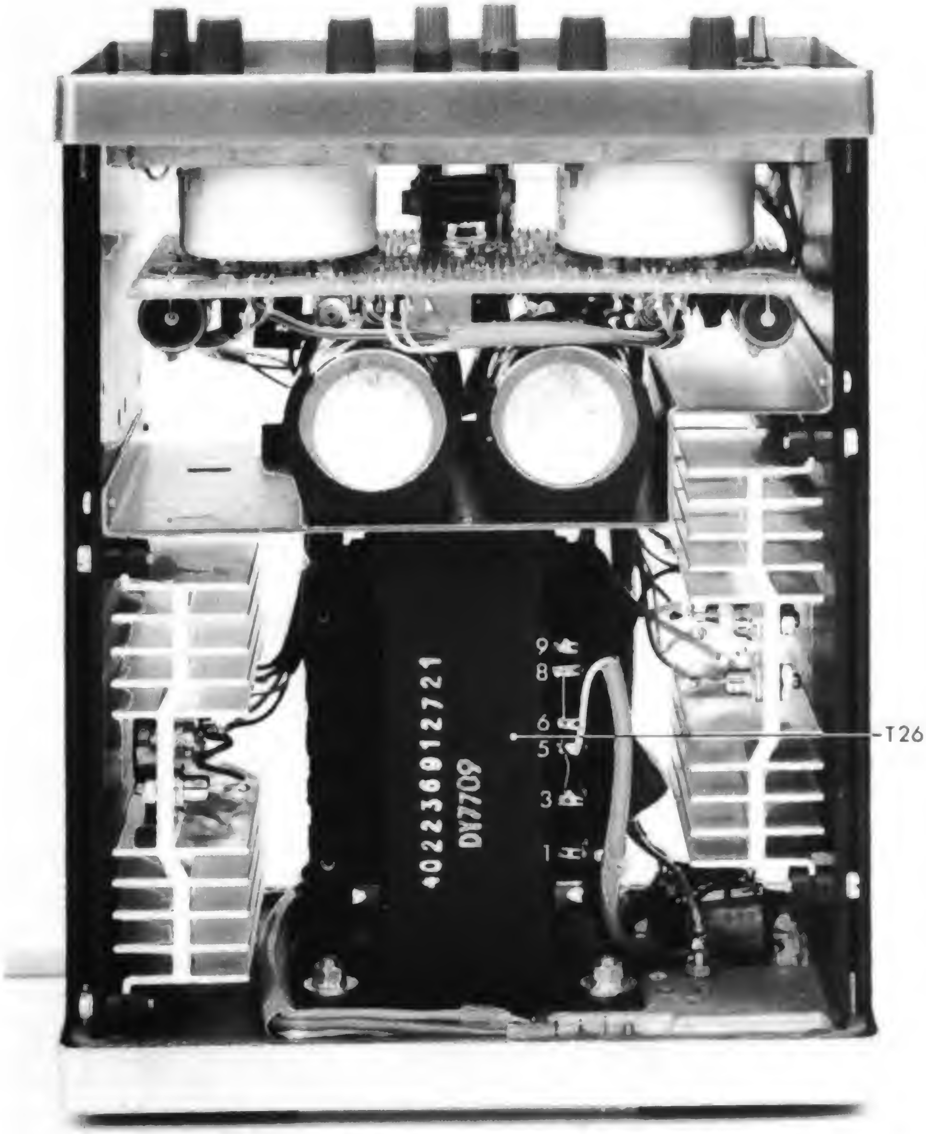

Fig. /Abb. 3.

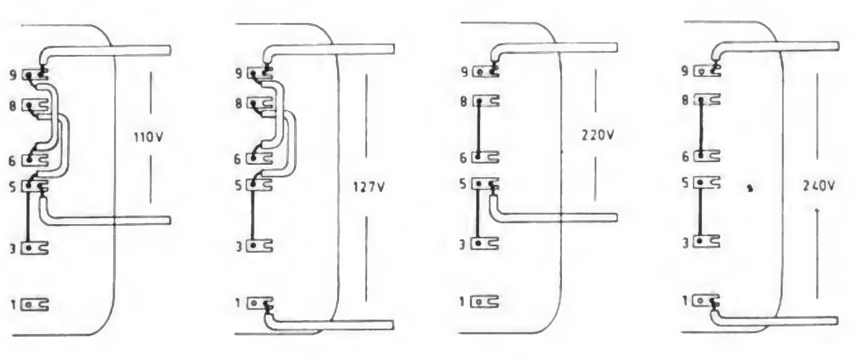

Fig. /Abb. 4.

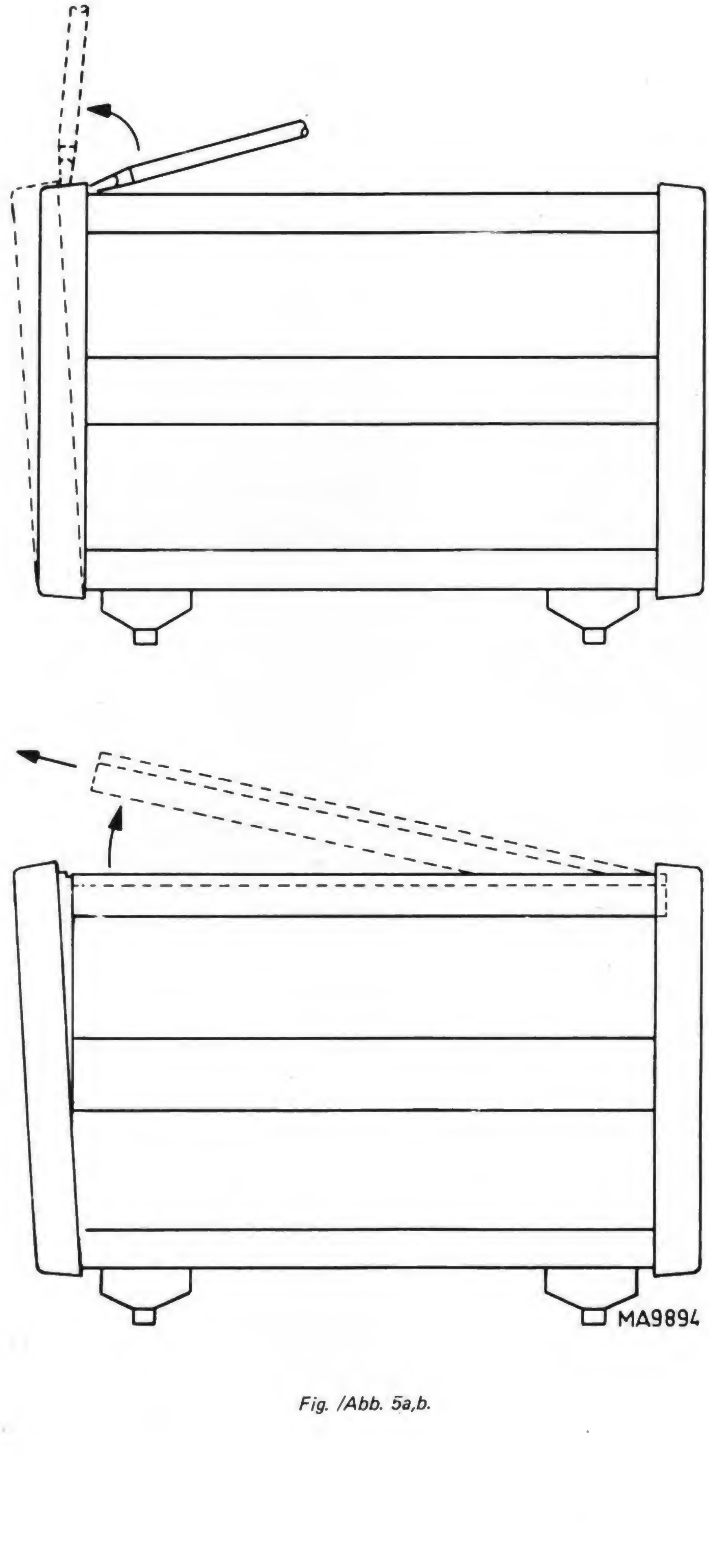

Fig. /Abb. 5a,b.

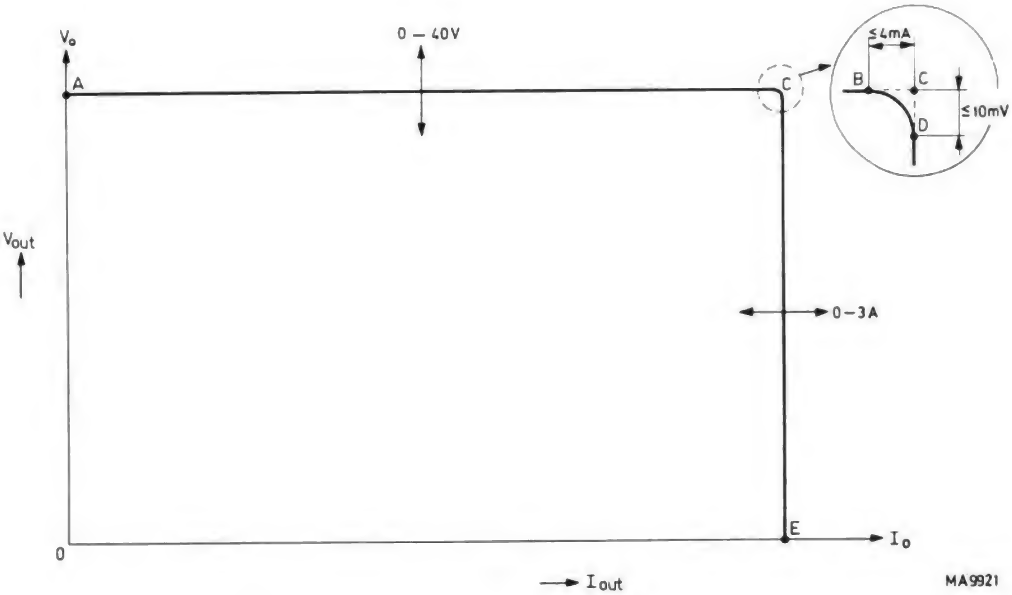

Fig./Abb. 6.

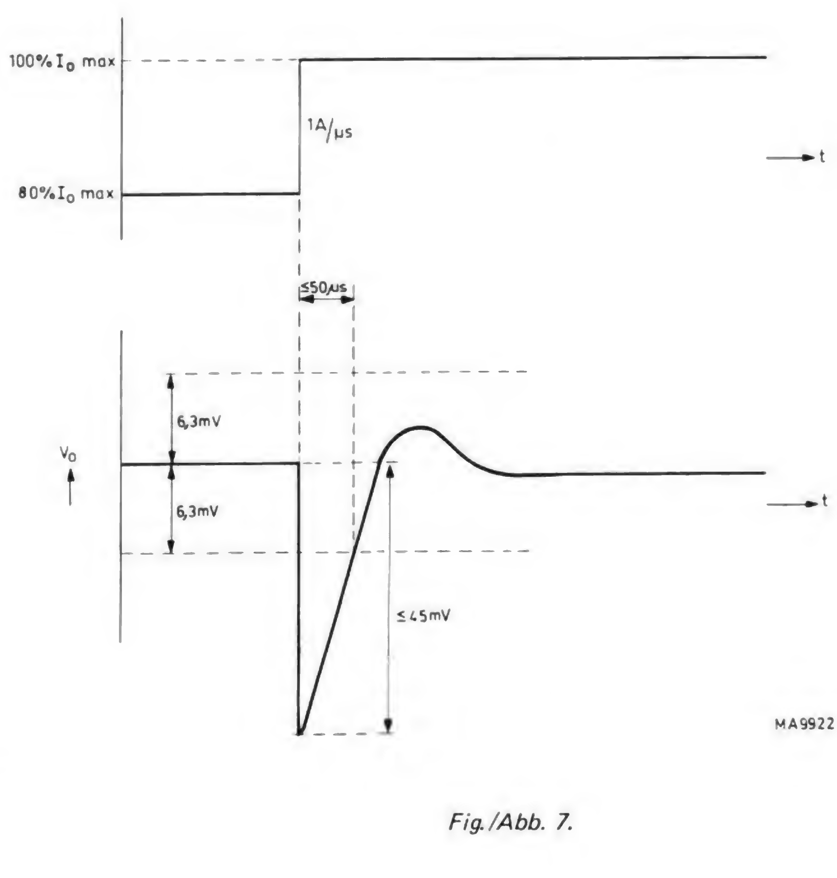

Fig./Abb. 7.

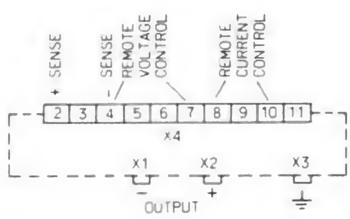

Fig. 8a. Connection on terminal block X4

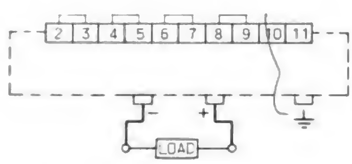

Fig. 8b. Normal use

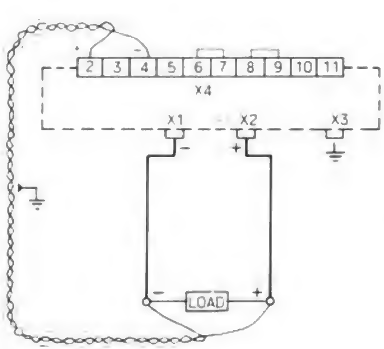

Fig. 8c. Remote sensing

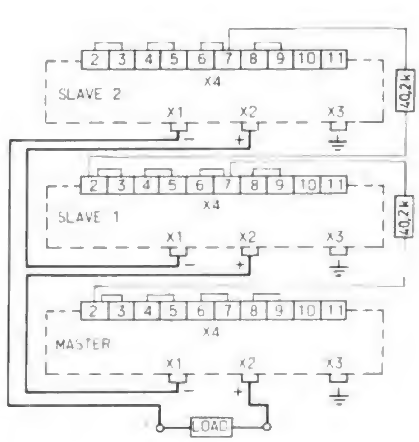

Fig. 8h. Series connection according to "Master-Slave" system

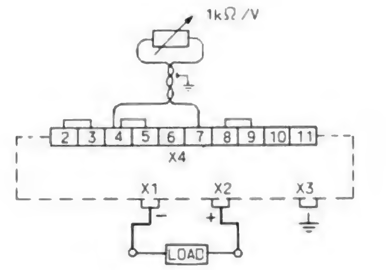

Fig. 8d. Remote voltage control with external resistor

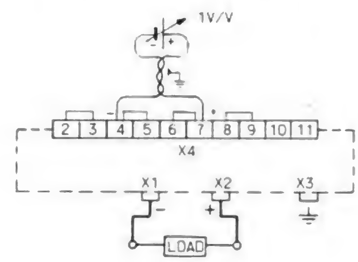

Fig. 8e. Remote voltage control with external voltage

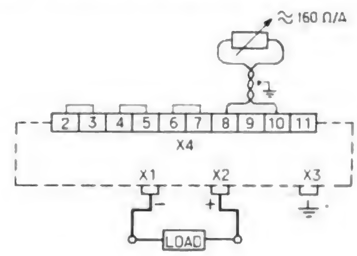

Fig. 8f. Remote current control with external resistor

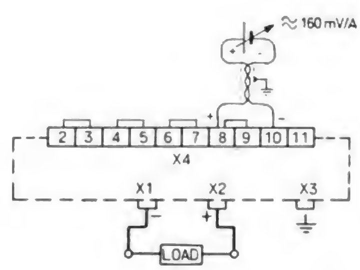

Fig. 8g. Remote current control with external voltage

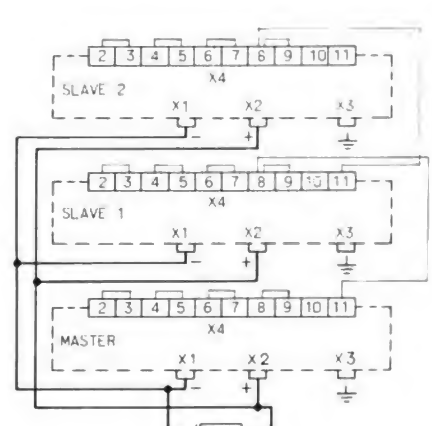

Fig. 8i. Parallel connection according to "Master-Slave" system

MA9929

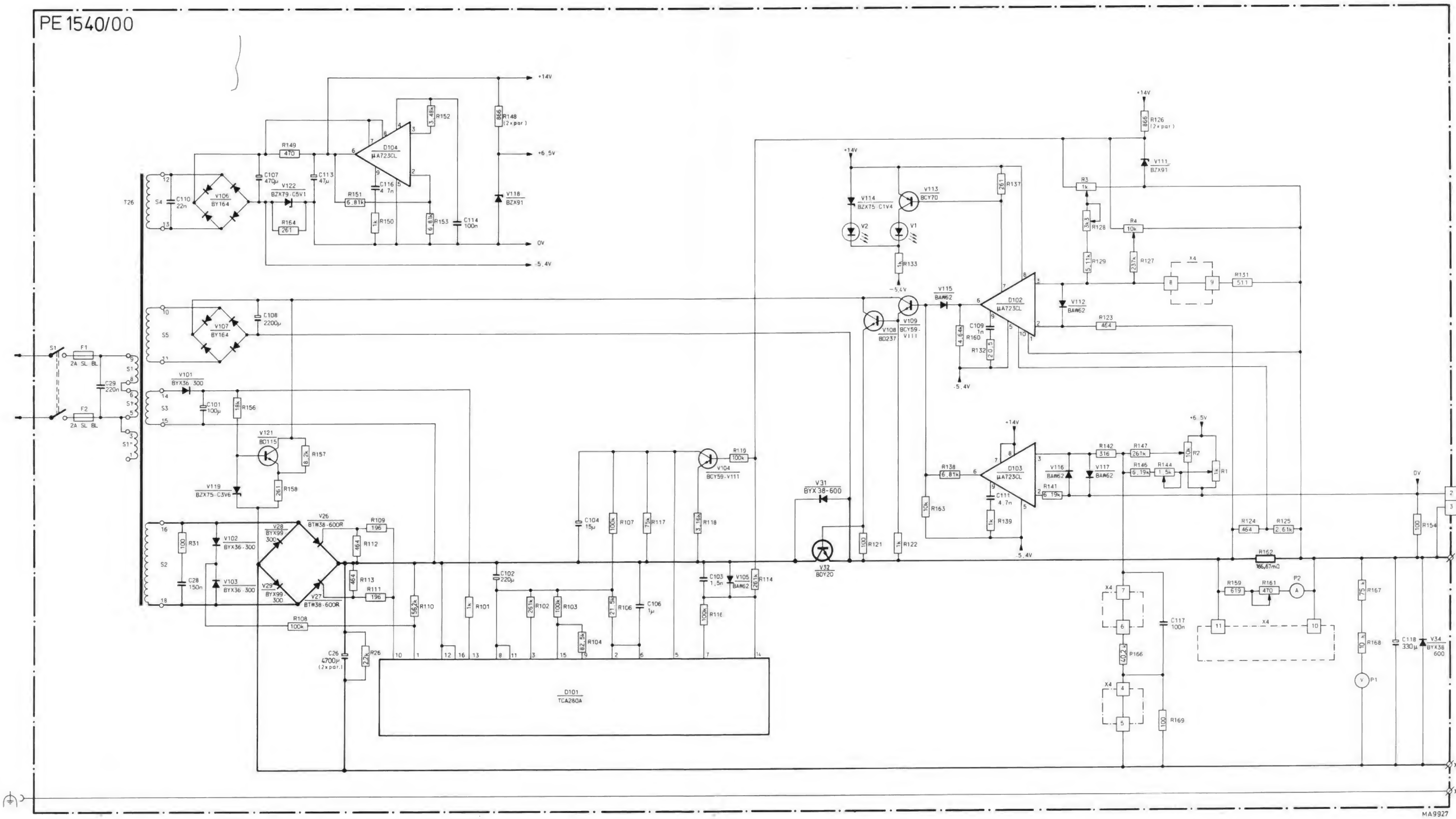
PE 1540/00
D104
µA723CL
D102
µA723CL
D103
µA723CL
D101
TCA280A
V32
BDY20
V31
BYX 38-600
+14V
+6,5V
0V
-5,4V
X1 (-)
X2 (+)
X3
MA9927

Fig./Abb. 9.

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Morocco: Samtel, 2 Rue de Bapaume, Casablanca; tel. 243050-243052

Nederland: Philips Nederland B.V., Hoofdgroep PPS, Boschdijk 525, Gebouw VB, Eindhoven; tel. 793333

Ned. Antillen: Philips Antillana N.V., Postbus 523, Willemstad; Curaçao; tel. 37575–35464

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Norge: Norsk A.S. Philips , Industri og Forsking, Essendrops gate 5, Postboks 5040, Oslo 3; tel. 463890

Österreich: Oesterreichische Philips Industrie GmbH, Abteilung Industrie Elektronik, Breitenfurterstrasse 219, A-1230 Wien; tel. (222)-831501/05

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Perù: Philips Peruana S.A., Apartado Aereo 1841, Lima 5; tel. 326070

Philippines: Philips Industrial Development Inc., 2246 Pasong Tamo, P.O.B. 911, Makati Rizal D-708; tel. 889453 to 889456; 868951

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Saoudi Arabia: A. Rajab and A. Silsilah, P.O. Box 203, Jeddah - Saudi Arabia; tel. 27392/5

Schweiz-Suisse-Svizzera: Philips A.G., Binzstrasse 15, Postfach 307, Ch 8027 Zürich; tel. 442211

Singapore: Philips Singapore Private Ltd., P.O. Box 340, Toa Payoh Central Post Office; Singapore 12; tel. 538811

South Afrika: South African Philips (Pty) Ltd., P.O.B. 7703, 2 Herb Street, New Doornfontein, Johannesburg 2000; tel. 240531

South-Korea: Philips Electronics (Korea) Ltd., P.O. Box 3680, Seoul; tel. 737222

Suomi: Oy Philips Ab., Kaivokatu 8, P.O. Box 10255, 00101 Helsinki 10; tel. 17271

Sverige: Svenska A.B. Philips, Philips Industrielektronik, Lidingövägen 50, Fack, S10250 Stockholm; tel. 635000

Syria: Philips Moyen-Orient S.A., Rue Fardoss 79, Immeuble Kassas and Sadate, B.P. 2442, Damas; tel. 18605–21650

Taiwan: Philips Taiwan Ltd., San Min Building, P.O. Box 22978, Taipei

Tanzania: Philips (Tanzania) Ltd., Box 20104, Dar es Salaam; tel. 29571

Thailand: Philips Electrical Co. of Thailand Ltd., 283 Silom Road, P.O. Box 961, Bangkok; tel. 233-6330

Tunisia: S.T.I.E.T., 32815, Rue Ben Ghedhahem, Tunis; tel. 244268

Türkiye: Türk Philips Ticaret A.S., Posta Kutusa 504, Beyoglu, Gümüssüyü Caddesi 78/80, Istanbul 1; tel. 435910

Uganda: Philips Uganda Ltd., P.O. Box 5300, Kampala; tel. 59039

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Zaire: Philips S.Z.R.L., B.P. 1798, Kinshasa; tel. 31887-31888-31693-31208

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For information on change of address:
N.V. Philips'Gloeilampenfabrieken
Test and Measuring Instruments Dept.
Eindhoven - The Netherlands

For countries not listed:
N.V. Philips S&I Export Dept.
Test and Measuring Instruments Dept.
Eindhoven - The Netherlands